

## PORTABLE MEDICAL QUESTIONNAIRE PRESENTATION DEVICE

This application is a continuation, of application Ser. No. 07/711,616 filed Jun. 6, 1991 now abandoned, which in turn is a continuation-in-part of Ser. No. 07/130,934 filed Dec. 9, 1987, now U.S. Pat. No. 5,025,374.

### REFERENCE TO MICROFICHE APPENDIX

A microfiche appendix to this patent application, comprising three sheets of microfiche, contains 256 frames of computer program listings illustrating a preferred embodiment of the computer software code contemplated by the invention disclosed below.

### BACKGROUND OF THE INVENTION

This invention relates to a device for administering a medical questionnaire, and more particularly to a portable computerized device which administers a questionnaire to a patient, even if the patient is bed-ridden, and is capable of printing out a full report of the information obtained using the questionnaire, including advice to the physician concerning the patient's health status, indicated pre-operative or other medical tests, an assessment of the patient's risk in undergoing certain medical procedures, suggestions concerning the health effects of the patient's lifestyle, and other health-related information.

It has been estimated that of the approximately \$30 billion spent each year in the United States for medical tests, as much as 60% of that amount (\$18 billion) is wasted on unnecessary tests; i.e., those which, for a given patient, would not be needed if the physician had the benefit of a reliable medical history. See, for example, *Are We Hooked on Tests*, U.S. News & World Report, Nov. 23, 1987, pp. 60-65, 68-70, 72.

This problem of unnecessary testing is particularly acute in cases where a patient is about to undergo surgery and, in order to determine the proper anesthesia, the patient's general medical history is taken.

This medical history strongly influences which diagnostic tests the medical staff chooses to perform before surgery. For example, if the patient discloses that he or she has any pain or discomfort upon urination, or has noticed any blood in the urine, then a urinalysis (a chemical analysis of the urine) ought to be performed. But if those symptoms are not present, it is considered medically unnecessary to administer a urinalysis, absent some other medical indication for the test.

Under current medical practice, it requires about seventy-five or more questions to determine which, if any, of the various available pre-operative tests (urinalysis, chest x-rays, EKG, etc.) might have to be performed before determining what anesthesia ought to be used during surgery. If the physician is not sure that all these questions were properly asked, or has doubts about the care with which the patient's answers have been recorded, he or she is likely to include in the battery of pre-operative tests many that could have been excluded based on an accurate patient history.

To save the time of physicians, questionnaires have been devised that can be administered by a nurse or other trained medical worker, or even directly filled in by the patient. But the time of a trained medical worker is also too valuable to spend on such tasks, since that makes the individual unavail-

able to perform other, more pressing, medical tasks which require such training.

If the patient completes the questionnaire alone, he or she may overlook or ignore some of the questions. Also, if the patient usually reads in a foreign language or has vision problems, he or she may have trouble completing the questionnaire alone.

Even if a questionnaire is fully and properly filled out, tallying of the patient's answers to determine which tests are needed is a time-consuming and tedious task, in the course of which medical workers sometimes inadvertently introduce errors.

Because of these problems, all too often a reliable medical history of this type is not taken prior to surgery, in which case the patient may have to undergo a comprehensive battery of pre-operative tests, many of them unneeded. These unnecessary tests are expensive for the patient and a burden on an already overworked medical system. In addition, the more tests are done the greater is the risk of false positives and iatrogenic harm from pursuit of false positives. Therefore, there is a great need to "automate" the reliable taking and tabulating of pre-operative test questionnaires.

However, the need for accurate, extensive information as to a patient's current and previous medical status is not limited to situations in which the patient is about to undergo surgical procedures. For example, an extensive inquiry into a patient's medical history and current health is useful in developing an appropriate plan of preventive health care. Where a patient may be a member of a group at high risk for certain types of disease, an extensive inquiry concerning symptoms and lifestyle characteristics associated with the causes or symptoms of those diseases aids the physician in detecting and treating them.

Severe time constraints may prevent physicians from directly soliciting this information from the patient, and patients may be unwilling to disclose certain details about their medical conditions to medical personnel who are not physicians. Hence, existing schemes for soliciting detailed medical condition information from a patient may not reveal important clues concerning health conditions for which the patient may be at risk.

In addition, in many medical disciplines, it is desirable to derive, from information obtained from the patient, a numerical measure of the patient's health risk, surgical risk, capacity to function in daily life, or the like. The numerical measure permits the patient's performance or medical condition to be more easily compared with those of other patients. At present, the raw data required to calculate these numerical measures are abstracted from the patient's medical history, and the measure is calculated, by clerical personnel. This process is time-consuming and expensive, and is susceptible to human error. Accordingly, there is a significant need to automate the data collection and calculations required to produce these numerical measures.

It is also often desirable for the physician to counsel the patient concerning lifestyle changes which may help to improve the patient's health or reduce health risk. Because the physician is under severe time constraints, his or her attention may be primarily directed to the patient's current medical problems. Accordingly, the need exists for means to automatically remind the physician of lifestyle counseling which may be indicated by the health-related information obtained from the patient.

### THE PRIOR ART

The prior art has proposed the use of computers or computer terminals to automate the taking of general-pur-